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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/572,956

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EXAMINER

DRENNAN, BARRY T

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/572,956	Applicant(s) KAKINAMI ET AL.	
	Examiner Barry Drennan	Art Unit 4133	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 March 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 March 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>3/21/06, 6/21/06, 2/9/07, 6/13/07</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Priority

1. This application claims priority as a national stage application under the Patent Cooperation Treaty, with effective filing date 22 September 2004, and claims foreign priority of application JP 2003-331356, filed in Japan on 24 September 2003.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: "Device for detecting road edge lines while ignoring peripheral transverse bars and similar road markings".

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claim elements "edge point detection means for...", "segment group producing means for...", "curve detection means for...", and "lane boundary detection means for..." are means plus function limitations that invoke 35 U.S.C. 112, sixth

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paragraph. However, the written description fails to clearly link or associate the disclosed structure, material, or acts to the claimed functions such that one of ordinary skill in the art would recognize what structure, material, or acts perform the claimed function. It appears that no actual structure is provided in the specification, which merely describes these means as "edge point detection means," etc.

Applicant is required to:

(a) Amend the claim so that the claim limitation will no longer be a means (or step) plus function limitation under 35 U.S.C. 112, sixth paragraph; or

(b) Amend the written description of the specification such that it clearly links or associates the corresponding structure, material, or acts to the claimed function without introducing any new matter (35 U.S.C. 132(a)); or

(c) State on the record where the corresponding structure, material, or acts are set forth in the written description of the specification that perform the claimed function.

For more information, see 37 CFR 1.75(d) and MPEP 2181 and 608.01(o).

Claim Rejections - 35 USC § 101

5. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows (see also MPEP 2106):

Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and

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Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.

When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and *Warmerdam*, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).

In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See *Lowry*, 32 F.3d at 1583-84, 32 USPQ2d at 1035.

6. Claims 1-11 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 1-11 appear to define an apparatus using "means plus function" claim language. However, the specification does not disclose corresponding physical structure associated with each claim element, and the elements appear to be implementable as pure software. Therefore, the claim as a whole appears to be nothing more than a collection of software elements, thus defining functional descriptive material per se.

Functional descriptive material may be statutory if it resides on a "computer-readable medium or computer-readable memory". The claim(s) indicated above lack structure, and do not define a computer readable medium and are thus non-statutory for that reason (i.e., "When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized" – Guidelines Annex IV). The scope of the presently claimed invention encompasses products that are not necessarily computer readable,

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and thus NOT able to impart any functionality of the recited program. The examiner suggests:

1) Amending the claim(s) to embody the program on “computer-readable medium” or equivalent; assuming the specification does NOT define the computer readable medium as a “signal”, “carrier wave”, or “transmission medium” which are deemed non-statutory (refer to “note” below); or

2) Pointing out where the corresponding structure can be found in the specification that would clearly be indicative of a statutory apparatus, in a 112 6th paragraph sense.

Any amendment to the claim should be commensurate with its corresponding disclosure. No new matter should be introduced by way of amendment.

Note: “A transitory, propagating signal ... is not a “process, machine, manufacture, or composition of matter.” Those four categories define the explicit scope and reach of subject matter patentable under 35 U.S.C. § 101; thus, such a signal cannot be patentable subject matter.” (In re Nuijten, 84 USPQ2d 1495 (Fed. Cir. 2007)).

Should the full scope of the claim as properly read in light of the disclosure encompass non-statutory subject matter such as a “signal”, the claim as a whole would be non-statutory. Should the applicant’s specification define or exemplify the computer readable medium or memory (or whatever language applicant chooses to recite a computer readable medium equivalent) as statutory tangible products such as a hard drive, ROM, RAM, etc, as well as a non-statutory entity such as a “signal”, “carrier wave”, or “transmission medium”, the examiner suggests amending the claim to include

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the disclosed tangible computer readable storage media, while at the same time excluding the intangible transitory media such as signals, carrier waves, etc.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-5, 8, and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Otsuka et al., U.S. Patent Application Publication 2003/0103650 A1 (published 5 June 2003, hereinafter Otsuka).

9. With respect to claim 1, Otsuka discloses:

A device for detecting a road traveling lane, from images on a road surface continuously picked up by image pickup means, comprising:

edge point detection means for detecting a plurality of edge points in a contour on the image (paragraph 38, "...data representing each of the edge points includes position information x and y..." and Fig. 3 #4);

segment group producing means for providing a line segment for the plurality of edge points detected by said edge point detection means (Fig. 3 #5), on the basis of continuity of distance and direction (paragraph 44, "These edges are paired up with each other...") between neighboring edge points, and grouping a plurality of line

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segments having a predetermined relationship with each other (paragraph 44), to produce a segment group;

curve detection means for detecting a curve fitted to the segment group produced by said segment group producing means (paragraph 45, "straight lines of the left and right lane markers are estimated based on the distribution of edge points having angles of $\theta-l$ and $\theta-r$ "); and

lane boundary position defining means for comparing a plurality of curves distributed in the vicinity of right and left lane boundaries out of the curves detected by said curve detection means (paragraph 46, "From two straight lines obtained through these procedures, a centerline is obtained and designated as the left white line,") with the segment groups produced by said segment group producing means, to define an innermost marking line (Fig. 6 #62 or #61, depending on which side of the road the detected edges are positioned toward), when a segment group forming a curve closest to the center of said traveling lane has a predetermined length and repeated cycle, and define a position of a neighboring curve outside of said innermost marking line relatively to the center of said traveling lane, as a position of a boundary of said traveling lane (Fig. 6 #63).

10. With respect to claim 2, Otsuka discloses:

A device for detecting a road traveling lane as described in claim 1, wherein said segment group producing means produces said segment group for a group including a predetermined line segment and another line segment provided in an area of the

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predetermined distance and direction relative to the predetermined line segments in said plurality of line segment (paragraph 44, *supra*; Fig. 3 #5; Fig. 6).

11. With respect to claim 3, Otsuka discloses:

A device for detecting a road traveling lane as described in claim 1, wherein said segment group producing means provides said line segment for a group of edge points including the plurality of edge points detected by said edge point detection means, on the basis of continuity of distance and direction between neighboring edge points (paragraph 44, *supra*).

12. With respect to claim 4, Otsuka discloses:

A device for detecting a road traveling lane as described in claim 1, wherein said segment group producing means determines that there is a predetermined relationship, to be processed as one group, when there is another line segment in an area of the predetermined distance and direction relative to a predetermined line segment, in a group of line segments based on said plurality of line segments (Fig. 6 #62 or #61).

13. With respect to claim 5, Otsuka discloses:

A device for detecting a road traveling lane as described in claim 1, wherein said curve detection means applies a curve-fitting to the grouped line segments, to detect said curve (paragraph 46, "Least squares approximation or the like may be used..." and *supra*; Fig. 6 #63).

14. With respect to claim 8, Otsuka discloses:

A device for detecting a road traveling lane, from images continuously picked up on the road by image pickup means, comprising:

edge point detection means for detecting a plurality of edge points from a contour on the images (paragraph 38, *supra*; Fig. 3 #4);

curve detection means for detecting curves fitted to the plurality of edge points detected by said edge point detection means (paragraph 45, *supra*);

segment group producing means for grouping groups of edge points contributed to the curves detected by said curve detection means, to produce segment groups (paragraph 44, *supra*; Fig. 3 #5); and

lane boundary position defining means for comparing a plurality of curves distributed in the vicinity of right and left lane boundaries out of the curves detected by said curve detection means (paragraph 46, *supra*), with the segment groups produced by said segment group producing means, to define an innermost marking line (Fig. 6 #62 or #61), when a segment group produced for a curve closest to a center of said traveling lane indicates a predetermined length and repeated cycle, and define a position of a neighboring curve outside of said innermost marking line relatively to the center of said traveling lane, as a position of a boundary of said traveling lane (Fig. 6 #63).

15. With respect to claim 9, Otsuka discloses:

A device for detecting a road traveling lane as described in claim 8, wherein said segment group producing means provides an edge histogram for the groups of edge points provided for the curves detected by said curve detection means, and groups the groups of edge points contributed to peaks of said histogram, to produce segment groups (paragraph 44, “[P]eaks appear for certain particular edge angles. A histogram is therefore created,” and Fig. 5B).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Otsuka as applied to claim 1 above, and further in view of Ohta, U.S. Patent Application Publication 2002/0159616 A1 (published 31 October 2002, hereinafter Ohta).

18. With respect to claim 6, Otsuka discloses the determination of whether line segments have a predetermined length and cycle (implicitly by virtue of the presence of shorter peaks than those for solid lines in the generated histogram, paragraph 44 and Fig. 5B), but does not disclose using this determination in removing those segments from consideration when finding road edge markings.

However, Ohta discloses detecting a wide variety of road markings and removing those from an image when detecting other objects (paragraph 107 and Fig. 8).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the road edge detection system of Otsuka with the road marking removal system of Ohta, motivated by the need to remove spurious signals from consideration when attempting to find target objects (Ohta, paragraph 16).

19. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Otsuka as applied to claim 9 above, and further in view of Ohta.

20. With respect to claim 10, Otsuka discloses the determination of whether line segments have a predetermined length and cycle via histogram (implicitly by virtue of the presence of shorter peaks than those for solid lines in the generated histogram, paragraph 44 and Fig. 5B), but does not disclose using this determination in removing those segments from consideration when finding road edge markings.

However, Ohta discloses detecting a wide variety of road markings and removing those from an image when detecting other objects (paragraph 107 and Fig. 8).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the road edge detection system of Otsuka with the road marking removal system of Ohta, motivated by the need to remove spurious signals from consideration when attempting to find target objects (Ohta, paragraph 16).

21. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Otsuka as applied to claim 1 above, and further in view of Kakinami et al., U.S. Patent 5,991,427 (issued 23 November 1999, hereinafter Kakinami).

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22. With respect to claim 7, Otsuka discloses the detection of edge points in the image in projected-space coordinates, but does not disclose transforming those coordinates back into 3-d space.

However, Kakinami discloses detecting edge points and then transforming those edge points from projected space back into 3-d space (Fig. 5 #102, 104, 105).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the road edge detection system of Otsuka with the coordinate transformation of Kakinami, motivated by the simplified calculations (parallel road lines converge toward a distant point of convergence in projected space, but are truly parallel in 3-d space) and additional potential uses (reconstruction of 3-d scenes with the collected data) once the edge points are transformed back into 3-d space.

23. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Otsuka as applied to claim 8 above, and further in view of Kakinami.

24. With respect to claim 11, Otsuka discloses the detection of edge points in the image in projected-space coordinates, but does not disclose transforming those coordinates back into 3-d space.

However, Kakinami discloses detecting edge points and then transforming those edge points from projected space back into 3-d space (Fig. 5 #102, 104, 105).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the road edge detection system of Otsuka with

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the coordinate transformation of Kakinami, motivated by the simplified calculations (parallel road lines converge toward a distant point of convergence in projected space, but are truly parallel in 3-d space) and additional potential uses (reconstruction of 3-d scenes with the collected data) once the edge points are transformed back into 3-d space.

Conclusion

25. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure, as it is drawn to methods of detecting road edge lines through image processing.

Nakayama et al., U.S. Patent 5,359,666 A.

Kakinami et al., U.S. Patent 6,172,600 B1.

Kakinami et al., U.S. Patent 6,205,234 B1.

Sasaki et al., U.S. Patent 6,445,809 B1.

Oike et al., U.S. Patent 6,449,383 B1.

26. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Barry Drennan whose telephone number is 571-270-7262. The examiner can normally be reached on Monday through Thursday and alternate Fridays from 8:30am to 4:00pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Abul Azad can be reached on 571-272-7599. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Barry Drennan/
Examiner, Art Unit 4133

/ABUL AZAD/
Supervisory Patent Examiner, Art Unit 4133